THE USDA SNAKE RIVER CONSERVATION RESEARCH CENTER - ITS DESIGN, DEVELOPMENT AND PROGRAM [a]

By A. R. Robinson, F. ASCE, M. ASAE [1]

INTRODUCTION

The Snake River Conservation Research Center is a newly completed facility located in south-central Idaho. The Center is designed for conducting basic and applied research studies on soil and water problems existing throughout the upper Snake River Plains and the surrounding region. The Center is unique in many respects. It is located in the center of a large agricultural area and is designed for scientists to conduct basic research under controlled laboratory conditions and guide the research through closely controlled trials and to eventual field application. The research program is cooperative with the University of Idaho Experiment Stations and other state and federal agencies.

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[a] Contribution from the Northwest Branch, Soil and Water Conservation Research Division, Agricultural Research Service, USDA; Idaho Agricultural Experiment Station cooperating.

[1] Research Agricultural Engineer and Director, Snake River Conservation Research Center, Kimberly (Twin Falls), Idaho.

AREA SERVED AND NEED

The upper Snake River Plains, a land of contrast - mountains, sagebrush, lava beds, excellent farmland and growing cities - encompasses 34 million acres in the Columbia River Basin. The bulk of the area is in southern Idaho and eastern Oregon but also includes small portions of western Wyoming, northern Utah and northern Nevada. In 1964 there were almost 2.9 million acres of irrigated cropland in southern Idaho, with newly irrigated lands being developed by private capital at a rate of approximately 60,000 acres per year.[2/] Rangeland covers more than 27 million acres in the region. Soils of the area are of many types, mostly volcanic in origin, and the topography ranges from nearly level to high mountain terrain. Annual precipitation in the region varies from 5 to 30 inches with most areas receiving from 8 to 10 inches.

Major crops under irrigation are dry beans, sugar beets, wheat, potatoes, corn, and alfalfa. About 90 percent of the nation's seed beans are grown in the area. Irrigated pastures are also widely used. Dryland crops, primarily wheat, are grown mostly in southeastern Idaho and eastern Oregon. Cattle and sheep ranching spreads across vast rangelands of the region. Rangeland forage is mainly annual grasses in dry areas and intermediate type perennial bunchgrass where precipitation is higher. Large programs of sagebrush eradication and reseeding of range grasses have been underway. Sizeable wet meadow areas occur in higher mountain valleys.

Water ranks high on the list of basic resources of this region and improved utilization will be a major factor in future agricultural and economic progress. The total water supply is ample if conserved

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[2/] D. C. Larsen, "Water for Idaho," Idaho Reclamation Association, Boise, Idaho, December 1964.

and used to maximum benefit and efficiency. The soil and water problems are many and the establishment of a research center in the region was requested to complement the work being accomplished by state experiment stations and other federal agencies.

A working group was appointed by the Secretary of Agriculture in 1959 to hold hearings throughout the nation for determining research needs in soil and water conservation. The results and recommendations from these hearings were published as Senate Document No. 59. [3/] This report detailed some of the problems and research needs found for the area. Some of these are as follows:

"The region is plagued by floods . . . . Intensive research is required on the hydrologic characteristics of watersheds in areas where runoff is derived from melting snow, rainfall or both and where the ground may or may not be frozen."

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"On both irrigated and nonirrigated cropland, improved cropping systems and methods of residue management must be developed to create surface conditions that would alleviate both wind and water erosion."

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"Proper soil management, tillage, stripcropping, and cropping practices on cropland must be developed as well as determination of adequate management of rangeland soils."

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"The whole gamut of irrigation and drainage problems is present at one location or another over the irrigated parts of the region.

"The region has many unique problems in soil fertility involving deficiencies of minor elements."

[3/] Facility Needs - Soil and Water Conservation Research, Senate Document No. 59, 86th Congress, 1st Session, 1959.

The research needs of greatest urgency in this area were listed as follows:

Watershed engineering:

- Precipitation-runoff relationships
- Sedimentation
- Channel stability and sedimentation of valleys
- Groundwater recharge

Water management:

- Consumptive use and optimum soil moisture levels
- Water intake rates of soils
- Hydraulics of surface irrigation
- Drainage of irrigated land

Erosion control:

- Equation for predicting erosion rates
- Stripcropping

Soil management:

- Moisture conservation methods
- Conservation cropping systems
- Crop residue management
- Fertility requirements for conservation farming
- Salinity and alkali problems

Plant management:

- Conservation practices on rangelands

HISTORY

As a result of the hearings and study, it was determined that existing facilities in the area were inadequate to meet the urgent problems pertaining to soil and water resources in this region. Several additional research facilities were proposed. One of these was as follows:

> "Snake River Valley - A major field station should be established in this valley . . . . The facility should

provide office, laboratory, greenhouse, storage and implement housing space to support a field program on water management problems prevalent on irrigated farms and associated dryland farms and rangelands in the Snake River Valley and similar agricultural areas in the region."

Funds were appropriated for design and construction of the facility in 1960. Construction of the Snake River Conservation Research Center was initiated in October 1962 and was completed in October 1963. The initial staff moved into the facility at that time and by July 1965 staffing was over three-fourths completed.

The Research Center was built and will be operated and maintained by the U. S. Department of Agriculture, Agricultural Research Service, Soil and Water Conservation Research Division.

FACILITIES

The research facilities included in the Snake River Conservation Research Center consist of soil chemistry, fertility, physics, mechanics and microbiology laboratories, and engineering, specialized isotope and constant temperature laboratories. A large irrigation and drainage laboratory is housed separately. The laboratories were designed by scientists and engineers working in the discipline for which the space will be used. Soil and plant processing, weighing and drying facilities are included in a greenhouse-headhouse building. The greenhouse provides a controlled environment for growing plants year-round. At an early date weighing lysimeters will be constructed, isolating a large block of soil on which crops can be grown, and very precise measurements made of the amount of water used depending on the crop, environmental conditions, and other factors. Extensive electronic instrumentation has been obtained and a limited amount of computing equipment will be installed.

The Center is located on a 10-acre tract of donated land 6 miles east of Twin Falls, Idaho, adjacent to the University of Idaho's Twin Falls Branch Experiment Station. Immediately surrounding the Center, 30 acres of irrigated cropland have been obtained for conducting field studies. Other land will be obtained at widely separated locations throughout the valley as needed.

Machine and specialized research shop facilities are provided along with accomodations for repair and maintenance of farm, automotive and scientific equipment. Other facilities include a conference room, library, photographic laboratory, drafting room, special instrument room and abundant storage areas.

STAFF

A productive study of soil and water conservation research problems requires a multidisciplinary approach. This approach is reflected in the training and experience of the staff. The research staff at the Center consists primarily of engineers and soil scientists. The engineers include specialists in irrigation, drainage, hydraulics, and flow in porous media. The soil scientists have specialties in soil physics, soil chemistry, fertility, microbiology, microclimate and soil-water-plant relationships. In addition, the staff will include those trained in soil and range conservation, plant physiology and micrometeorology. At full staff, about twenty-five scientists will be headquartered at the Center including several from the University of Idaho and the U. S. Weather Bureau. Each of the scientists will have one or more research assistants and technicians for a total of about 50 people to be headquartered at the Center.

GENERAL PROGRAM

The objective of the program is to conduct research which will assist in developing sound water and soil conservation practices

for the area. Therefore, a sizeable percentage of the program will be in the field and directed toward the solution of current problems. Most research assignments will be of the combined field-greenhouse-laboratory type. Some of the studies, however, will be entirely field or exclusively laboratory in nature. It is intended that a fundamental approach be employed under both the field and laboratory studies. Not all of the work will be carried on directly at the Research Center headquarters. Some will be distributed throughout the Snake River Basin.

The research program at the Snake River Conservation Research Center is planned by having conferences with state and federal agencies, technicians, farmers and ranchers, and is designed to fit the most pressing needs of the area which it is to serve.

Examples of research projects that will be undertaken are:

Control of Evaporation --Research will be aimed at developing methods and systems for controlling evaporation from soil and water surfaces. About half of the water used in agriculture is lost by direct evaporation from soil or water surfaces. Therefore, the potential water savings by evaporation control is tremendous.

Water Conveyance -- This work will concentrate on improving present and developing new water control structures, water measuring devices, and automatic gates and checks. Better water management leading to more efficient use will be the major goal.

Design of Irrigation Systems -- Work will be directed mainly toward the design and management of gravity, sprinkler, underground, and pump-back irrigation systems to improve water use efficiency.

Soil Fertility and Plant Nutrition --Research on soil fertility will include studies of major and minor nutrient element needs of crops grown under a variety of soils, crop rotations, climatic conditions, and management practices; efficiency of fertilizer use as related to moisture conditions on irrigated lands, cultivated drylands, range-land, and high elevation wet meadows; and residual effects of applied fertilizers. The relation of certain elements to occurrence of animal diseases will also be studied.

Water Use and Plant Growth --As the value of water increases, more accurate data are needed on water requirements of plants. The many factors that influence plant growth and water consumption must be studied to develop systems for using water at maximum efficiency.

Soil Microbiology --Soil microbiologists and chemists will study how soil microorganisms decompose organic matter, factors which influence this process, and the nature of chemical compounds developed. All aspects of crop production, crop residue management, soil fertility, and soil structure are closely related to the complex microbial activity in soils. For example, the transformation of nutrients in organic matter into forms available to plants and the part played by organic compounds in soil structure pose a multitude of unanswered questions.

Seepage Measurement and Control --Work on this subject will include developing and testing low-cost materials and techniques for lining irrigation ditches and canals. As with much of the other work, the main objective here is water savings.

Salinity and Alkali Problems -- Scientists will seek solutions to the salinity and alkali problems that occur in many parts of the basin.

Drainage of Irrigated Lands --In many areas crop yields are reduced or the land has gone out of production because of a high water table. In this research, subsurface drainage techniques will be developed and improved so they can be applied to local conditions.

Moisture and Heat Flow -- Soil temperatures are important in the development of crops. Ways and means to control these temperatures will be studied. Moisture movement is basic to plant growth and the mechanics and control of this movement are extremely important.

During the two years of operation, progress has been made on the following research studies:

Development of automatic gates and checks for control of water.

Development and improvement of water measuring devices.

Study of the hydraulics of surface irrigation methods and return flow systems.

Sprinkler irrigation studies concerned with uniform water distribution and infiltration rates under sprinklers.

Soil moisture - fertility studies on sugar beets.

Factors affecting farm and project irrigation efficiencies.

Reclamation of slick spot soils - deep plowing

Effect of mulches on soil temperature, heat flow and moisture flow, and the resulting crop production.

Fertility-moisture level studies on potatoes.

Effect of different tillage practices on potatoes.

Effect of different tillage practices on beans - soil profile modification.

Relationship of occurrence of selenium to white muscle disease in animals.

Decomposition of straw as affected by quantity and quality.

Fertility levels needed for reseeding success on rangelands.

SUMMARY

The Research Center concept represents a new trend in agricultural research by locating scientists from many disciplines and with varied experience together for a concerted effort in solving agricultural soil and water problems. Future requirements for food to support the increasing population demand a scientific approach to soil and water technology similar to that now existing for medical research, space travel and atomic energy. Large schemes for continent-wide transportation of water to areas of shortage require a thorough knowledge of the soil and water factors for the area to be served.

The Snake River Conservation Research Center is designed to supply better practices, equipment and techniques developed through research. These findings will be put into use by farmers, ranchers, Soil Conservation Service and Extension Service personnel and those from other conservation agencies.